

REMARKS

STATUS OF THE CLAIMS

Claims 1, 3, 5, 10-15, 17-27, 29-40, 42-46, and 48-57 are currently pending.

Claim 9 was canceled, without prejudice to its assertion in a continuing application.

Claims 1, 10, 11, 17, 18, 20, 32, 38, 39, 45, 49, 50, and 51 have been amended.

In claim 1, the definition of R_1 has been amended to " C_{3-10} hydrocarbyl group". Support for this amendment can be found in the description, for example on page 10, lines 26-27. Further, " $0.1 \leq n < 2$ " has been amended to " $0 \leq n < 2$ ". Support for this amendment can be found in the description, for example on page 11, lines 2-3. Still further, "having an average particle size distribution between 1 to 500 μm " has been introduced. Support for this amendment can be found in the description, for example on page 9, lines 24-27. And finally, the definition of compound (II) has been amended to "halogen-containing aluminium compound selected from the group consisting of dimethyl aluminium chloride, diethyl aluminium chloride, methyl aluminium dichloride and ethyl aluminium dichloride". Support for this amendment can be found in the description, for example on page 11, lines 26-30.

In claims 10, 11, 17, 18, 20, 32, 38, 39, 45 and 49-51 the definition of the Mg and Al compounds has been adapted to the definition in claim 1.

No new matter has been added.

1. Rejection of Claims 1-57 Based on 35 U.S.C. § 112, First Paragraph

Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 stand rejected as allegedly containing new matter. In response, Applicants have amended claim 1 by replacing " $0.1 \leq n < 2$ " with " $0 \leq n < 2$," which is fully supported by the specification as filed. In light of this amendment, Applicants submit that this rejection is moot, and they request that it be withdrawn.

2. Rejection of Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 based on 35 U.S.C. § 102(b)

Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 stand rejected as allegedly being anticipated by Gessell (US 4,496,660) and Garoff (WO 01/55230). Applicants respectfully disagree. They reiterate their prior arguments, and note the following.

A) Gessell (US 4,496,660)

First of all, it should be noted that Gessell is directed to the preparation of a catalyst, whereas the present invention is directed to the preparation of a catalyst support. Thus, the inventions are different.

Additional evidence that the currently pending claims differ from Gessell, can be seen by comparing the properties of the catalyst,

which may be prepared from the catalyst support of the present invention, to the catalyst of Gesell.

One comparable feature in both the present invention and Gesell is the state of reduction of, for example, Ti in the catalyst. In every embodiment of Gesell, a reducing agent has to be reacted with the Ti catalyst in the last step in order to reduce the Ti^{4+} (from $TiCl_4$) to Ti^{3+} or Ti^{2+} . This is due to two reasons: (a) the addition order (Al compound to Mg compound), and (b) the fact that in Gesell, the resulting solid product is extensively washed to remove all hydrocarbon soluble reaction products. In contrast, the present invention does not require the addition of a separate reducing agent because about 50% of the Ti has been spontaneously reduced in the catalyst just by contacting the $TiCl_4$ and the support material (cf. Table 3 of the present invention).

Due to the different oxidation state of the Ti, a higher activity catalyst is prepared from the catalyst support of the present invention. Thus, the skilled man will inevitable recognize that the catalyst support of the present invention must have different and superior properties to any solid product in the catalyst preparation in the prior art, in particular in Gesell. And if the properties are different, then the supports are different.

As already indicated above, the two main reasons for the different properties of the catalyst support are (a) the addition order (Al compound to Mg compound), and (b) the fact that in Gesell, the

resulting a solid product is extensively washed to remove all hydrocarbon soluble reaction products.

Further, Applicant notes that the only reasonably comparable example of Gesell is example 22. However, this example is different from the preparation process of the present invention. In example 22, dibutylmagnesium is reacted with triisobutylaluminium, n-propylalcohol and silicon tetrachloride. As a result, a hydrocarbon insoluble product is obtained which is further reacted with TiCl_4 and $(\text{Et})_2\text{AlCl}$. However, in the present invention, a Mg compound according to formula (I) is reacted with dimethyl aluminium chloride, diethyl aluminium chloride, methyl aluminium dichloride or ethyl aluminium dichloride to form the solid catalyst support. This reaction is not disclosed in Gesell. This is further evidence that the process of example 22 and the process of the present invention are different.

Finally, in the present invention, a catalyst support is obtained having an average particle size distribution between 1 to 500 μm . Gesell is totally silent with respect to this feature. This can be seen as a further indication that the specific steps of the present invention (addition order, washing step) lead to particles having properties not disclosed in the prior art.

In light of the above, Applicants respectfully request reconsideration and withdrawal of the novelty rejection based on the Gesell reference.

B) Garoff (WO 01/55230)

Garoff is directed towards the preparation of a catalyst by impregnating liquid catalyst components onto a porous support material. Garoff is totally silent with respect to the preparation of a solid catalyst support. As a result, Garoff differs fundamentally from the present invention.

Further, Applicants wish to bring the Office's attention to page 13, lines 1-9 of the present invention. In this paragraph, the solvents used in the present invention are listed. Thus, the skilled man will recognize that the same solvents or solvent mixtures (e.g. toluene-pentane solvent mixture) are used in the present invention and in Garoff. No other way of interpretation is possible. In this solvent system, the addition of an Al compound to a Mg compound leads to a Mg complex which is dissolved in the solvent mixture (cf. page 16, lines 30-31 of Garoff). No precipitation occurs. However, in the present invention, the different addition order, i.e. adding the Mg compound to the Al compound, leads to a precipitate, which forms the solid catalyst support. Thus, contrary to the Office's position, changing the addition order of the components in the same solvent systems surprisingly leads to totally different physical properties of the obtained product: solid vs. liquid. Garoff does not make the solid support, nor does he mention it. Rather, in example 4, he used silica that he bought. Consequently, the inventions are different, and Garoff does not anticipate the currently claimed invention.

Finally, as a consequence of the above, Garoff is also totally silent with respect to the claimed narrow average particle size distribution of between 1 to 500 μm , which is obtained by the preparation process of the present invention.

Applicants respectfully request reconsideration and withdrawal of the anticipation rejection based on Gesell.

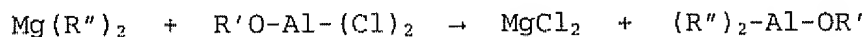
3. Rejection of 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 Based on 35 U.S.C. § 103(a) in view of WO 99/55741 (Vereecke et al.)

Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 stand rejected for allegedly being obvious in view of WO 99/55741 (Vereecke et al.). Applicants respectfully disagree.

Several differences between Vereecke and the currently claimed invention exist. First, in Vereecke's patent claim 1 it is said that the produced support material is washed in order to remove all unwanted reducing power of the support material. As already explained above, by reducing power should here be understood the reducing power towards Ti^{4+} in the added TiCl_4 . This is done by two ways in Vereecke's support synthesis. First by adding alcohol to the R-Al-(Cl)_2 chlorination agent to eliminate its reducing power according to:

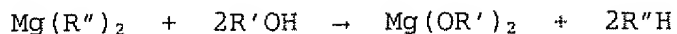


In this reaction, the shorter alkyl chain "R" of the Al chlorinating agent has been replaced by a "R'O" group. When this chlorination agent is reacting with Mg(R'')_2 the longer R" group from the Mg compound is transported over to Al making it more soluble according to:



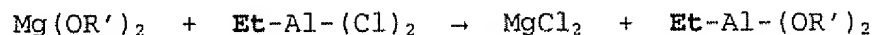
In Vereecke's synthesis the reducing power of the now formed $(\text{R''})_2\text{-Al-OR'}$ compound is washed away, which is more easily done as the Al compound now has a much longer alkyl group attached to it, thus leading to an improved solubility. As stated in Vereecke's patent, the support material is washed in order to remove all reduction power of the support material.

In contrast, in the instant application, the Mg(R'')_2 is first reacted with the alcohol according to:



When this Mg compound is reacted with the Al-chlorinating agent, the resulting Al-alcoholate is much less soluble due to the presence of the shorter alkyl chain. This means, that there is still a shorter alkyl chain present in the obtained Al-alcoholate contrary to Vereecke (as explained above). This short alkyl chain, which is part of the original Al-chlorination agent, has been replaced by "R'O" in

Vereecke's preparation process leading to a more soluble product, whereas in the present invention it remains in the Al compound. The chemical equation of this step in the present invention is:



Due to the lower solubility of the formed Et-Al-(OR')₂ compound, it is more difficult to wash the Al-compound away. Thus, the reducing power of the support material of the present invention can be adjusted by a defined and controlled washing step in which the amount of Al compound present in the solid support will be adjusted. According to the present invention, the molar ratio of aluminium to magnesium in the support has a value of at least 0.3 after the washing procedure. This means that the final catalyst support consists of a defined composition of the MgCl₂ and Et-Al-(OR')₂. An example of the reducing power of the currently claimed support is demonstrated in Table 3 (p. 26). The adjustment of the reducing power is not possible in Vereecke due to the above explained solubility of the obtained Al compound which is easily washed away with an excess of wash solution (cf. e.g. page 8, 4th paragraph of Vereecke). Thus, the properties of the obtained catalyst support are different to that of Vereecke.

Further, the Al compound that is reacted with the Mg compound is different than in Vereecke. In the present invention dimethyl aluminium chloride, diethyl aluminium chloride, methyl aluminium dichloride or ethyl aluminium dichloride is used, whereas in Vereecke

an R'O-Al-(Cl)₂ compound is actually used. Nothing in Vereecke suggests the use of the claimed Al compounds.

Applicants further submit that the use of the currently claimed Al compounds affords a surprising and unexpected result, i.e., a precipitate forms. For example, the skilled man would not use the Al compounds of Garoff (being the same as the Al compound of the present invention) in the process of Vereecke to arrive at the teaching of the present invention, as in Garoff the use of this Al compound does not lead to any precipitation at all and thus, the skilled man would not consider such a Al compound for the preparation of a solid catalyst support as claimed in the present invention. A person of ordinary skill in the art would expect all Al compounds to afford such a soluble product as in Garoff.

Still further, the addition order with respect to the reaction of the Al and Mg compounds is different. In Vereecke it is explicitly stated that the addition of the Al compound to the Mg compound is not suitable for the production of a catalyst with a narrow particle size distribution (cf. page 11, lines 3-4). In the present invention, however, a narrow particle size distribution between 1 to 500 μm is obtained. Thus, Vereecke clearly teaches away from the currently pending claims.

Taking the above differences between the present invention, Vereecke, and any other references into account, the skilled man could not arrive at the teaching of the present invention. Thus, the currently pending claims are not obvious. Consequently,

reconsideration and withdrawal of the rejection based on 35 U.S.C. §103(a) is requested.

CONCLUSION

Applicants respectfully contend that all requirements of patentability have been met. Allowance of the claims and passage of the case to issue are therefore respectfully solicited.

Should the Examiner believe a discussion of this matter would be helpful, he is invited to telephone the undersigned at (312) 913-2114.

Respectfully submitted,

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